

# NOTICE

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HSR Division

August 1, 2002

Notice No. 0095

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## **ELECTRICAL SAFETY REQUIREMENTS IN NATIONAL FIRE PROTECTION STANDARDS (NFPA) 70E WITH SPECIAL EMPHASIS ON ARC FLASH HAZARDS**

- Purpose** The purpose of this notice is to alert organizations that the requirements in NFPA 70E “Standard for Electrical Safety Requirements for Employee Workplaces 2000 Edition” must be followed at LANL. Particular emphasis must be placed on those requirements for individuals performing electrical work on or near energized electrical conductors or circuit parts which may have a hazard for an electrical flash injury. The training and work practice requirements in the standard apply primarily to electrically qualified persons as defined in the [Electrical Safety LIR 402-600-01](#). This LIR and this Notice serve as the framework for the NFPA requirements that must be implemented.
- Applicability** All LANL SRLMs and subcontractors must implement the requirements of NFPA 70E, including the provision to provide training and the protective clothing and personal protective equipment (PPE) as required by the 2000 Edition of NFPA 70E for employees working within the flash protection boundary of exposed electrical circuit parts.
- Background** A JCNNM electrician at LANL was injured by an arc-flash while closing a 480V/40A circuit breaker. It is surmised that the closure of the breaker produced sparking due to a loose lug that initiated a cascade of arcing down the connector lugs on the right side of the 480V panel. The electrical panel was missing part of the metal cover. The incident occurred as a result of equipment failure. The individual sustained localized first and second degree burns to the index and ring fingers of his right hand. This incident has resulted in the use of compensatory safety measures by JCNNM electricians. Typically serious burn injury, including death, and extensive equipment damage occurs in this type of accident. NFPA 70E contains safety-related work practices that will be used if live parts have not been placed in an electrically safe work condition. The application of these requirements are expected to reduce or eliminate the likelihood of this type of accident/injury. Most of these accidents could be prevented or their severity significantly reduced if electrically qualified workers wear the required type of protective clothing.

The addition of the NFPA 70E requirements to the Laboratory's Electrical Safety program ([LIR 402-600-01](#)) is intended to provide clarification and amplification of practices to improve employee safety.

In addition, NFPA 70 (NEC 110.16 Flash Protection) contains a new requirement for labeling equipment installed after January 2002 with a hazard warning for arc flash hazards. These hazard labels serve to warn qualified electrical workers of potential electrical arc flash hazards.

## Definitions

**Electrically Qualified Worker**--A worker who has been determined by his/her supervisor to have the skill, knowledge, and abilities to safely perform the work to which he/she is assigned. ([Electrical Safety LIR402-600-01](#))

**Flash Hazard**—A dangerous condition associated with the release of energy caused by an arc that suddenly and violently changes material(s) into a vapor. ([Electrical Safety LIR402-600-01](#))

**Working Near**—Any activity inside the limited approach boundary or the flash protection boundary (see NFPA 70E) of exposed energized electrical conductors or circuit parts that are not put into an electrically safe condition. ([Electrical Safety LIR402-600-01](#))

**Working On**—Coming in contact with exposed energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing. ([Electrical Safety LIR402-600-01.1](#))

## Requirements

Live parts to which employees may be exposed must be put into an electrically safe work condition before an employee works on or near them unless there is a compelling reason that the work must be performed energized i.e.:

1. increased or additional hazards of de-energizing critical systems; and/or
2. infeasibility due to equipment design or operational limitations (e.g. testing of electric circuits that can only be done with the circuit energized).

Only qualified electrical workers shall be permitted to work on electrical conductors or circuit parts that have been put into an electrically safe work condition. An electrically safe work condition shall be achieved and verified by the following process:

- Determine all sources of electrical supply to the specific equipment. Check applicable drawings, diagrams, and identification tags.
- After correctly interrupting the load current, open the disconnecting device for each source.
- Where it is possible, visually verify that all blades of the disconnecting devices are fully open or that draw out type circuit breakers are withdrawn to the fully disconnected position.
- Apply lockout/tagout devices in accordance with [“Lockout/Tagout for Personal Safety” LIR 402-860-01](#).
- Use the correctly rated voltage detector to test each phase conductor or circuit part to verify they are deenergized.

- Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them.

**When working on or near exposed electrical conductors circuit parts that are or might become energized the employee must be protected from arc flash and from contact with live parts. The following work practices must be utilized:**

- 1) A flash hazard analysis shall be done before a person approaches any exposed electrical conductor or circuit parts that has not been placed in an electrically safe condition.
- 2) Establish the flash protection boundary (see Section 2-1.3.3.2 of NFPA 70E).
- 3) Protective clothing and personal protective equipment shall be selected and provided in accordance with the requirements of NFPA 70E.
- 4) **A simplified alternative:** in lieu of the detailed flash hazard analysis, the standard allows the implementation of Table 3-3.9.1 of Part II requirements which consists of a number of common work tasks with the respective Hazard/Risk Category associated with each task. Once the Hazard/Risk Category has been identified, Table 3-3.9.2 of Part II shall be referred to. The assumed “normal” short circuit current capacities and fault clearing times for various tasks conducted on low-voltage (600 V, and below) equipment are listed in the notes to Table 3-3.9.1 of Part II. For tasks not listed, or for power systems of greater than the assumed “normal” short circuit current capacity or for longer than assumed fault clearing times (for the assumed current and time values, see the Notes to Table 3-3.9.1 of Part II, a flash hazard analysis is required in accordance with 2-1.3.3 of Part II.  
Once the Hazard/Risk Category has been identified, Table 3-3.9.2 lists the requirements that shall be implemented for protective clothing and other protective equipment based on Hazard/Risk Category numbers 0 through 4. This clothing and equipment shall be used when working on or near energized equipment within the Flash Protection Boundary.
- 5) All employees affected by the implementation of NFPA 70E must be trained by December 1, 2002.
- 6) The Hazard Control Plan or the Activity Hazard Analysis must specify the arc flash hazard and the protective clothing and PPE that must be worn.
- 7) All electrical equipment that was originally constructed, sold, listed, labeled or approved for use at Los Alamos National Laboratory, that was required to have covers or other protective equipment or assemblies in place during normal operational or maintenance activities shall have that equipment or assembly correctly installed before any activity involving operation or maintenance is attempted. In the event that covers or assemblies are damaged or missing they must be replaced with new, if available, or AHJ approved repair parts prior

to exposing any employee to the hazard. If the preceding is not possible all conditions of NFPA 70E and the Electrical Safety LIR shall be satisfied with regard to working on or near energized electric conductors or circuit parts for operation of or maintenance to the equipment.

**Access to NFPA 70E**

Access: Anyone with a LANL IP address can access these standards at <http://lib-www.lanl.gov/infores/stand/all2.html>.

**Next Steps:**

1. Once you have accessed the address, select “**Specs & Standards**” in the “**Standards Application**” column.
2. On the **Document Number** line, type 70E and click the upper Search button.
3. At the Search Results window select the **View All Revisions** for **NFPA 70E** dated 11 Feb 2000.
4. At the **NFPA 70E Document History** window select the **PDF NFPA 70E** document dated 11 Feb 2000
5. YOU ARE THERE---it may take the document 1 to 3 minutes to load. You can scroll to any page for review or printing.

**Training in NFPA 70E**

**Electrical Work PPE Requirements for NFPA 70E (2000) Self-Study (Course No. 24612) is now on line and credit will be recorded.**

**Questions**

If questions arise or assistance is required, contact a member of the LANL Electrical Safety Committee. The list is at <http://eshdb.lanl.gov/%7Eesh5/ElectricalSafety/Pages/membership.htm>  
HSR-5 is the OIC for this Notice.

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*This notice will remain in effect for one year or until incorporated into a LIR.*